CLAIMS:

1. A precision processing apparatus for processing an object (19) at accurately controlled positions, the apparatus comprising

- a working platform (12) for supporting the object (19) to be processed;
- a support structure (10) for providing support to the working platform (12), the working platform (12) being movable relative to the support structure (10) along a path, the support structure (10) containing a soft magnetic element (34) with a surface that extends in parallel with said path;
- an suspension actuator part (14) attached to the working platform (12), the suspension actuator part (14) comprising a soft magnetic core (24) with poles facing the surface of the soft magnetic element (34) and a winding (20) for application of a current to generate a magnetic field that runs through the core (24) via the poles and returns via the soft magnetic element (34);
- a position reference element (16), mechanically decoupled from the soft magnetic element (34);
- a sensor (17) for producing a sensing result indicative of a measured position of the suspension actuator part (14) relative to the position reference element (16);
- a control circuit comprising an outer control circuit (40) and an inner control circuit (42), the outer control circuit (40) receiving said sensing result and determining force set point information to regulate the measured position of the actuator part (14) to a required value, the inner control circuit (42) receiving the force set point information and controlling the current to realize a force between the actuator part (14) and the support structure (10) according to the force set point information.

2. A precision processing apparatus according to Claim 1, wherein the suspension actuator part (12) comprises a flux sensor and/or gap size sensor (22) coupled to the inner control circuit (42), the inner control circuit (42) adapting the current dependent on a sensed flux or gap size to realize the force according to the force set point information.

3. A precision processing apparatus according to Claim 1, comprising a magnetic field shielding wall (30, 32) on either side of a slot wherein the soft magnetic element and the poles of the soft magnetic core are provided.

4. A precision processing apparatus according to Claim 3, comprising a first and second pair of magnetic field shielding walls (30, 32) on either side of the slot, the walls (32) of the first pair being attached to the support structure (10) and extending parallel to said path along substantially the entire length of the path on either side of the slot, the walls (30) of the second pair being attached to the platform (12) and extending parallel to part of said path on either side of the slot.

5. A precision processing apparatus according to Claim 3, comprising a linear motor for driving the platform (12) to move along said path, the linear motor comprising a motor winding (38) attached to the platform (12) and rows of alternatingly poled magnets (36) attached to the support structure (10) and located between the magnetic field shielding walls (32), the motor winding (38) being provided between said rows of magnets (36), on a connection between the platform (12) and the soft magnetic core (24).

6. A precision processing apparatus according to Claim 1, comprising degaussing magnets (90) located adjacent said core (24) on at least one side trailing the core (24) along the direction of movement, arranged to reduce a remanent magnetization left by the magnetic field from said core (24) in the soft magnetic element (34).

7. A precision processing apparatus according to Claim 1, comprising at least one pretensioning permanent magnet (60) attached to the platform to act on the soft magnetic element (34) in parallel with the core (24) or through the core (24).

8. A precision processing apparatus according to Claim 1, wherein the suspension actuator part (14) comprises a first and second array of magnetizable fingers (80, 82), a first and second magnetizable common base (84, 86) on which all fingers (80, 82) of the first and second array are mounted respectively, and a magnetizable return path (88) coupling the first and second base (84, 86), the fingers (80, 82) of both the first and second array lying in a face of the core arrangement that faces a counter surface (89) of the soft magnetic element, the fingers (80) of the first array lying extending interdigitated with the

fingers (82) of the second array in said face; the winding (87) being arranged around the return path (88).

9. A precision processing apparatus according to Claim 8, wherein the fingers (80, 82) of the first and second array extend from the first and second base (84, 86) in mutually opposite directions.

10. A precision processing apparatus according to Claim 8, wherein the fingers (80, 82) of both the first and second array, the first and second base (84, 86) and the return path (88) are integral parts of a sheet of magnetizable material, the fingers (80, 82) of the first and second array forming crenellations extending from mutually opposite extreme parts of the sheet respectively, the sheet having been folded so that the extreme parts lie in said face, the crenellations of the opposite edges lying interdigitated in said face.

11. A precision processing apparatus according to Claim 1, wherein the outer control circuit (40) has an input for receiving information that is indicative of a movement related force experienced by the platform (12) due to movement along said path, the outer control circuit (40) compensating the force set point for the movement related force.

12. A precision processing apparatus according to Claim 1, comprising a particle beam source (18) for generating a beam (18a) of electrically charged particles directed at the object (19) on said platform (12).

13. A charged particle processing apparatus for processing an object (19) with a beam (18a) of charged particles, the apparatus comprising

- a working platform (12) for supporting the object (19) to be processed;
- a support structure (10) for providing support to the working platform (12), the working platform (12) being movable relative to the support structure (10) along a path, the support structure (10) containing a soft magnetic element (34) with a surface that extends in parallel with said path;
- a suspension actuator part (14) attached to the working platform, the suspension actuator part comprising a soft magnetic core (24) with poles facing the surface of the soft magnetic element (34) and a winding (20) for application of a current to generate

a magnetic field that runs through the core (24) via the poles and returns via the soft magnetic element (34);

- a magnetic field shielding wall (30, 32) on either side of a slot wherein the soft magnetic element (34) and the poles of the soft magnetic core (24) are provided.

14. A charged particle processing apparatus according to Claim 13, comprising a first and second pair of magnetic field shielding walls (30, 32) on either side of the slot, the walls (32) of the first pair being attached to the support structure and extending parallel to said path along substantially the entire length of the path on either side of the slot, the walls (30) of the second pair being attached to the platform and extending parallel to part of said path on either side of the slot.

15. A precision processing apparatus according to Claim 13, comprising a linear motor for driving the platform (12) to move along said path, the linear motor comprising a motor winding (38) attached to the platform and rows of alternatingly poled magnets (36) attached to the support structure (10) and located between the magnetic field shielding walls (30, 32), the motor winding (38) being provided between said rows of magnets (36), on a connection between the platform (12) and the soft magnetic core (24).

16. An apparatus with a reluctance actuator that comprises

- a counter surface (89) of magnetizable material;
- an active part mounted moveable relative to the counter surface (89), the active part comprising a first and second array of magnetizable fingers (80, 82), a first and second magnetizable common base (84, 86) on which all fingers (80, 82) of the first and second array are mounted respectively, and a magnetizable return path (88) coupling a first and second base (84,86), the fingers (80, 82) of both the first and second array lying in a face of the core arrangement that faces the counter surface (89), the fingers (80) of the first array lying extending interdigitated with the fingers (82) of the second array in said face;
- an electric coil (87) with at least one winding arranged to induce a magnetic field along the return path (88).

17. An apparatus according to Claim 16, wherein the fingers (80, 82) of the first and second array extend from the first and second base (84, 86) in mutually opposite directions.

18. An apparatus according to Claim 16, wherein the fingers (80, 82) of both the first and second array, the first and second base (84, 86) and the return path (88) are integral parts of a sheet of magnetizable material, the fingers (80, 82) of the first and second array forming crenellations extending from mutually opposite extreme parts of the sheet respectively, the sheet having been folded so that the extreme parts lie in said face, the crenellations of the opposite edges lying interdigitated in said face.

19. An apparatus according to Claim 17, comprising degaussing magnets (90) located adjacent said core on at least one side trailing the core along a direction of movement along the counter surface (89), to reduce a remanent magnetization left by the magnetic field from said fingers (80, 82) in the counter surface after movement of the active part.

20. An apparatus according to Claim 17, comprising at least one pretensioning magnet (60) coupled to the active part to act on the counter surface (89) in parallel with magnetic fields from the teeth or through the teeth.

21. An apparatus according to Claim 17, comprising a beam space and a particle source (18) for generating a beam (18a) of electrically charged particles in said beam space, the counter surface (89) being located adjoining the beam space.